

Scientific Note

***APHODIUS ALTERNATUS* HORN (APHODIINAE: SCARABAEIDAE), FIRST RECORD OF A SEMIAQUATIC SCARAB BEETLE**

Aphodius alternatus Horn belongs to a species group that is associated with moist habitats, generally along lake or stream margins (Gordon, R. 1977. Proc. Entomol. Soc. Wash; 79: 157–167) and are characterized by males that exhibit a large, down-curved laterally flattened anterior tibial spur (Horn, G. H. 1887. Trans. Amer. Entomol. Soc; (Philadelphia), 14: 1–110).

Aphodius alternatus has been reported from moist habitats along stream, pond, slough, and prairie pothole margins (Gordon 1977) and is widespread in distribution. It is recorded from Alberta, British Colombia, and Manitoba in Canada, and is reported from California, Colorado, Idaho, Iowa, Michigan, Montana, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington, Wisconsin, and Wyoming in the United States.

While studying vernal pool invertebrates, I occasionally collected *A. alternatus* floating on the surface or clinging to floating vegetation. These beetles were never common, and I initially believed them to have fallen into the pools inadvertently. When sampling over a larger geographic range, pools were located in which *A. alternatus* occurred in larger numbers (12 to 14 per square meter).

Aphodius sp. collected from droppings of nearby range cattle and the droppings chambers of the local ground squirrels and gophers and were found to be different species.

Aphodius alternatus were observed and collected from California grassland vernal pools from Shasta County south to Tulare and Monterey Counties. The biology of *A. alternatus* was observed in Shasta, Tehama, Placer, Sacramento, and Monterey Counties. Field observations were made from first appearance in January until the beetles died at the end of the vernal pool season.

Adults first appeared in vernal pools near the end of January. They were found clinging to floating vegetation, with one side of the abdomen exposed to air. When dislodged from the floating substrate, a beetle would reorient itself, dorsum up, flail its legs in a similar, although slower fashion as is observed in beetles of the family Hydrophilidae, and propel itself to another holdfast. Adults often let go of the vegetation to “swim” to another floating plant.

Aphodius alternatus were observed feeding on insects that had fallen into the pools and drowned; however, the beetles were often forced away from their food by the large numbers of aquatic gastropods (*Physatella* sp. and *Lymnaea* sp.), and numerous turbellarians also feeding on dead insects.

On warm, calm days at the end of March and into April, adults climbed as high as possible onto emergent vegetation, and then flew away. The beetles flew up to a height of 1.5–2 m in a slow zig-zag pattern. They then flew straight to another pool, paused about 0.5 m above the water surface, closed their wings and dropped into the water. During the zig-zag searching flight, the beetles flew back and forth over a 3 m wide area for a distance of up to 30 meters to find a pool. Some

beetles were observed flying across approximately 144 m² in five minutes. When the beetles located a pool, their flight speed increased to almost 1 m per second. Flight was observed only on still sunny days, with air temperatures at or above 17° C.

Mating occurred on the surface of the pools, when air temperatures rose above 19.5° C and the water temperature reached 10° C. Pairs in copula were only observed clinging to floating vegetation. Egg deposition was not observed.

Toward the end of April, the vernal pools begin evaporating. As the pools dried, invertebrates and amphibian larvae were concentrated into the deeper parts of the pool where they eventually died. Adult *A. alternatus* were observed to feed actively in these deposits of carrion which varied in weight from 2 to 26 g. *Aphodius alternatus* densities varied greatly between deposits, with no apparent relationship between the numbers of beetles and the weight or size of carrion. No movement of *A. alternatus* between carrion deposits was observed.

At various times after the drying of the pools, both carrion and soil samples were taken and sieved in an attempt to find *A. alternatus* larvae. Samples were collected from ten pools in which *A. alternatus* had previously been collected in large numbers. Soil samples were taken from beneath the carrion, various sites within the pools, from pool margins, and from areas between pools. Fifteen soil samples were taken per pool, along with a variable number of carrion samples depending on the number of carrion deposition sites within the pool. In only one sample, from Shasta County, was there an aphodine larva, which died before pupating.

Gordon (1977) reported that extensive variation occurs in *A. alternatus* throughout its range and that the species is made up of numerous disjunct populations. This is probable in California as populations seem to be restricted to specific vernal pool complexes.

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